MBT 68XX

MOTHERBOARD

PARADIO ELECTRONICS EXPORT

SYDNEY

EPHERE
80

MBT 68XX

MOTHERBOARD

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4.2 MOTHERBOARD MBT-68XX SPECIFICATIONS

The motherboard is mounted at the bottom of the Sphere chassis, and provides mechanical support and electrical interconnection for all circuit boards of the Sphere system. Expansion of the computer system is greatly simplified by the provision of eight full sized SS-50 connection slots and an additional eight 30-pin I/O slots. The MBT-68XX motherboard is a versatile "active" motherboard, contributing to the power and flexibility of the Sphere system. Its main features are:

1. Switch selectable 6800/6809 compatible I/O addressing
2. Switch selectable for 4 or 16 addresses per I/O slot
3. Baud rate generator on board for SS-50C and S/09 compatibility
4. Schmitt trigger buffers on all data, address and control lines for the I/O bus
5. Interrupt timer (MBT-68XX motherboard only)
6. Physical size and mounting replaces existing SWTPC 6800/6809 motherboards
7. High standard of construction, extra thick 2.5 mm epoxy board

I/O Addressing

DIP switches on the motherboard control the address block at which the I/O boards will appear in the memory map. Switches 3 to 7 inclusive set this addressing. These switches correspond to address lines A11 to A15.

Printed beside the switch block is a configuration guide for users of SWTPC 6800 and 6809 systems. As will be seen from this configuration guide, switch 7 should be OFF and switches 3 to 6 ON to correspond to the SWTPC 6800 system configuration. This provides a binary code of 10000, which when converted to a 16 bit HEX address locates the I/O block at addresses from 8000 to 8100 .

Switch positions labelled "6809" provide a binary address of 11100 which converts to addresses E000 to E100, and is the standard setting for Sphere systems. Any other 256 byte block in the memory map may be similarly selected.

4.2 I/O Slot Size

DIP switch 1 determines whether each I/O slot appears as 4 addresses or 16 addresses in the system memory map. Again a switch configuration guide is printed on the board adjacent to the switch block. For 6800 systems this switch should be OFF, setting the I/O slot size as 4 addresses. For 6809 systems such as the Sphere the switch should be ON, setting the I/O slot size as 16 addresses.

NOTE: Switch 2 is unused in the current Sphere configuration.

Description of operation

Data lines to the I/O boards are inverted and buffered by IC8, a bi-directional Tri-state buffer. This buffer has Schmitt trigger inputs, and provides a high degree of noise immunity. The direction of the buffer is controlled by the R/W line from the 6809 microprocessor and the buffer is enabled only when an I/O address is detected by IC7.

IC7 is a comparator which compares address lines A11 to A15 with the settings of the I/O address configuration DIP switches. If a valid compare is made then the data bus buffer is enabled and the I/O slot address decoder is enabled.

The I/O slot decoder (IC9) takes the three address lines fed to it by IC6 and decodes them into 1 of 8 I/O slot address lines. This decoding is indicated by the LED display array on the front panel of the Sphere MkII, providing an important verification of the correct operation of this section of the circuitry.

IC6 is a quad multiplexer which feeds either address lines A4 to A6 or A2 to A4 to the slot decoder IC9. This provides either 16 addresses or 4 addresses per slot, respectively. The input to the multiplexer is determined by the setting of DIP switch 1. For Sphere 6809 systems this switch should be ON, providing 16 addresses to each I/O slot.

IC4 inverts the E signal from the processor and provides gating for the VMA signal. It ensures that the comparator IC7 will be disabled if VMA is high.

IC3 is a Schmitt trigger buffer for the control lines E, R/W, RESET, RS0, RS1, RS2 and RS3.

IC1 is a baud rate generator, providing baud rates of 110, 300, 1200, 4800 and 9600. These baud rate signals are buffered by IC2 and fed to the I/O slots directly. This leaves the SS-50 bus lines S1 to S4 free to be used for extended addressing or other user defined options.

4.2 On the MBT-68XX motherboard additional circuitry is provided for multitasking and multi-user operations. A 50Hz reference signal from the power supply board is applied to IC10b via diodes. This signal is clamped to 5V by a transistor and input to the dual monostable IC10.

The output of IC10b (pin 9) drives IC11, a 6840 programmable timer. Signals from this timer are brought out for external use via a 3 pin connector at the left hand rear of the motherboard.

IC10a generates the master reset signal for the rest of the system. This signal is derived from IC11 via IC4. Transistor Q1 amplifies this signal to ensure that the system is reset predictably despite variations in the power supply detected by the transistor and associated components.

Switch 1 on the Sphere MK11 motherboard should be set according to the access time of the memory components being used. Fast memory (250ns or less) should be used with 6809 systems.

In summary, for 6809 systems, Switch 1 positions 1,2,3 and 4 should be ON, and positions 5,6 and 7 should be OFF.

A 5V regulator IC5 provides power for all ICs on the motherboard.

Tantalum electrolytic capacitors on the motherboard provide high frequency noise suppression on the power supply lines.

On the MBT-68XX mother board there is a 10-pin connector which provides connection points for the LED display on the front panel. This motherboard also includes four Light Emitting Diodes which are connected across the power supply rails of the board. When the system is powered up these LEDs indicate that power is available on the motherboard.

Points to note

The following points should be observed when checking out or testing the motherboard:

1. The ICs are NOT all oriented the same way and care should be taken to position pin 1 of each IC adjacent to the dot printed on the circuit board.

2. The tantalum capacitors are polarised components and must be oriented correctly.

3. Care should be taken to ensure that the power supply wiring is correct in the event of any replacement or repair which involves disconnecting the power supply. Correct connections for the power supply wiring are printed on the motherboard.

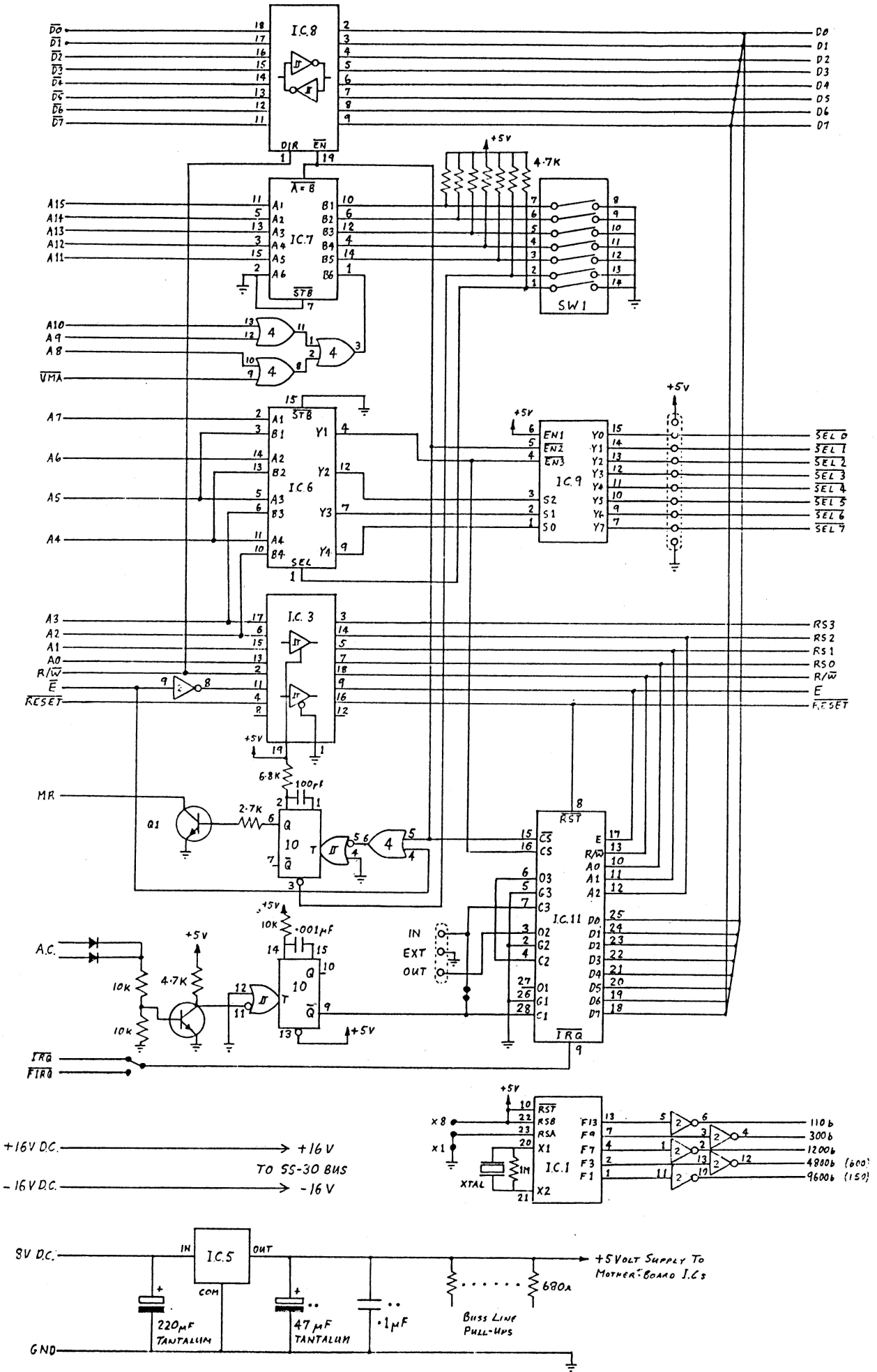
4. Power supply line capacitors are located as follows: 220uF beside IC5; 47uF between IC1 and IC2 and beside IC3,IC8 and R53; 0.1uF beside IC1, IC2, IC6 and IC9.

4.2 SPHERE MOTHERBOARD PARTS LIST

DESIGNATION	PART NO.	DESCRIPTION	QUANTITY
IC1	14411*	Baud rate generator	1
IC2	74LS04 *	Hex inverter	1
IC3	74LS241*	Octal 3 state buffer	1
IC4	74LS~~02~~*32	Quad NOR gate	1
IC5	7805*	5V regulator	1
IC6	74LS157*	Quad 2 input multiplexer	1
IC7	DM8131*	Hex comparator	1
IC8	74LS640*	Octal 3 state buffer	1
IC9	74LS138*	Dual 3 to 8 decoder	1
IC10	8602*4528/4538	Dual monostable	1
IC11	6840*	Programmable timer	1
CAPACITORS			
C1,C3,C6,C9,C10	0.1uF	Ceramic	5
C2,C4,C5,C7,C8	220uF*	Tantalum electrolytic	5
C11	.001uf	Ceramic	1
C12	100pF	NPO ceramic	1
RESISTORS			
R1-R27,R30-R44	680 ohm	1/4W resistor	41
R51-R52	680 ohm	1/4W resistor	2
R28,R29,R45-R50	4.7 kilohm	1/4W resistor	7
R53-R58,R69	4.7 kilohm	1/4W resistor	3
R59	1 Megohm	1/4W resistor	1
R60,R61	470 ohm	1/2W resistor	2
R62,R63	270 ohm	1/2W resistor	2
R64,67,68	10 kilohm	1/4W resistor	3
R65	6.8 kilohm	1/4W resistor	1
R66	2.7 kilohm	1/4W resistor	1
XTAL	1.8432MHz	Crystal	1
Q1,Q2*	2N2369 or 2N2222 NPN transistors		2
LEDs	Power supply indicators		4

NOTE: Components tagged with an asterisk (*) are polarity sensitive and must be installed with the correct orientation on the board. Components manufactured by Motorola Inc. include a letter in thetype designation to indicate the speed of the component. This designation is as follows;

No letter	1MHz
"A"	1.5MHz
"B"	2MHz


I.C.8
DIR
EN
D0
D1
D2
D3
D4
D5
D6
D7
+5V
4.7K
A=B
I.C.7
A15
A14
A13
A12
A11
STB
SW1
A10
A9
A8
VMA
I.C.6
A7
A6
A5
A4
SEL
I.C.9
EN1
EN2
EN3
S2
S1
S0
Y0
Y1
Y2
Y3
Y4
Y5
Y6
Y7
SEL 0
SEL 1
SEL 2
SEL 3
SEL 4
SEL 5
SEL 6
SEL 7
I.C. 3
A3
A2
A1
A0
R/W
E
RESET
RS3
RS2
RS1
RS0
6.8K
100pf
MR
Q1
2.7K
10
I.C.11
RST
CS
CS
O3
G3
C3
O2
G2
C2
O1
G1
C1
IRQ
IN
EXT
OUT
A.C.
10K
4.7K
.001μF
FIRQ
+16V D.C.
+16 V
TO SS-30 BUS
-16V D.C.
-16 V
I.C.1
XTAL
1M
x8
x1
RSB
RSA
F13
F9
F7
F3
F1
110b
300b
1200b
4800b (600)
9600b (150)
9V D.C.
I.C.5
IN
OUT
COM
220μF TANTALUM
47μF TANTALUM
·1μF
680Ω
BUSS LINE PULL-UPS
+5 VOLT SUPPLY TO MOTHER BOARD I.C's
GND

CHANGE NOTICE

If you purchase a bare Sphere motherboard you will need to be aware of the following modifications. These do not affect owner of assembled Sphere computer systems.
Due to PCB manufacture of some Sphere motherboards, there are six modifications which must be made to the board to ensure correct operation. Two of these modifications are made on the top, or component side of the board and four on the underside. Full details are shown overleaf.

On the top of the board, link pin 16 of IC7 to the wide print track which runs adjacent to the IC, +5 Volt rail. Also on the top of the board , cut the wide track adjacent to pin 16 of IC10 which joins to the end of R69. Do not cut either track going to pin 16 itself.

Shown below are some corrections to the motherboard which must be made to ensure correct operation in all modes of use. The components required for this modifications are specified in the parts list.

1) CUT THE COLLECTOR LINE WHICH GOES TO GROUND ON Q2 AS SHOWN

2) LINK BASE OF Q1 WITH THE 2.7K RESISTOR CONNECTED TO IC10

3) THE MODS ON 2ND PARG.

4) LINK IC9 PIN 4 TO IC 6 PIN 4

5) LINK IC9 PIN 5 TO IC 7 PIN 9

6) LINK IC2 PIN 14 TO +5 VOLT RAIL ADJACENT TO IC ON TOP OF PCB

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Per phone call to us from Sphere Computer regarding Universal 68XX MBT:

(1) IC 4 should be 74LS32 instead of 74LS02

(2) Pullup resistors R9 thru R25 and R39 thru R42 should be omitted.

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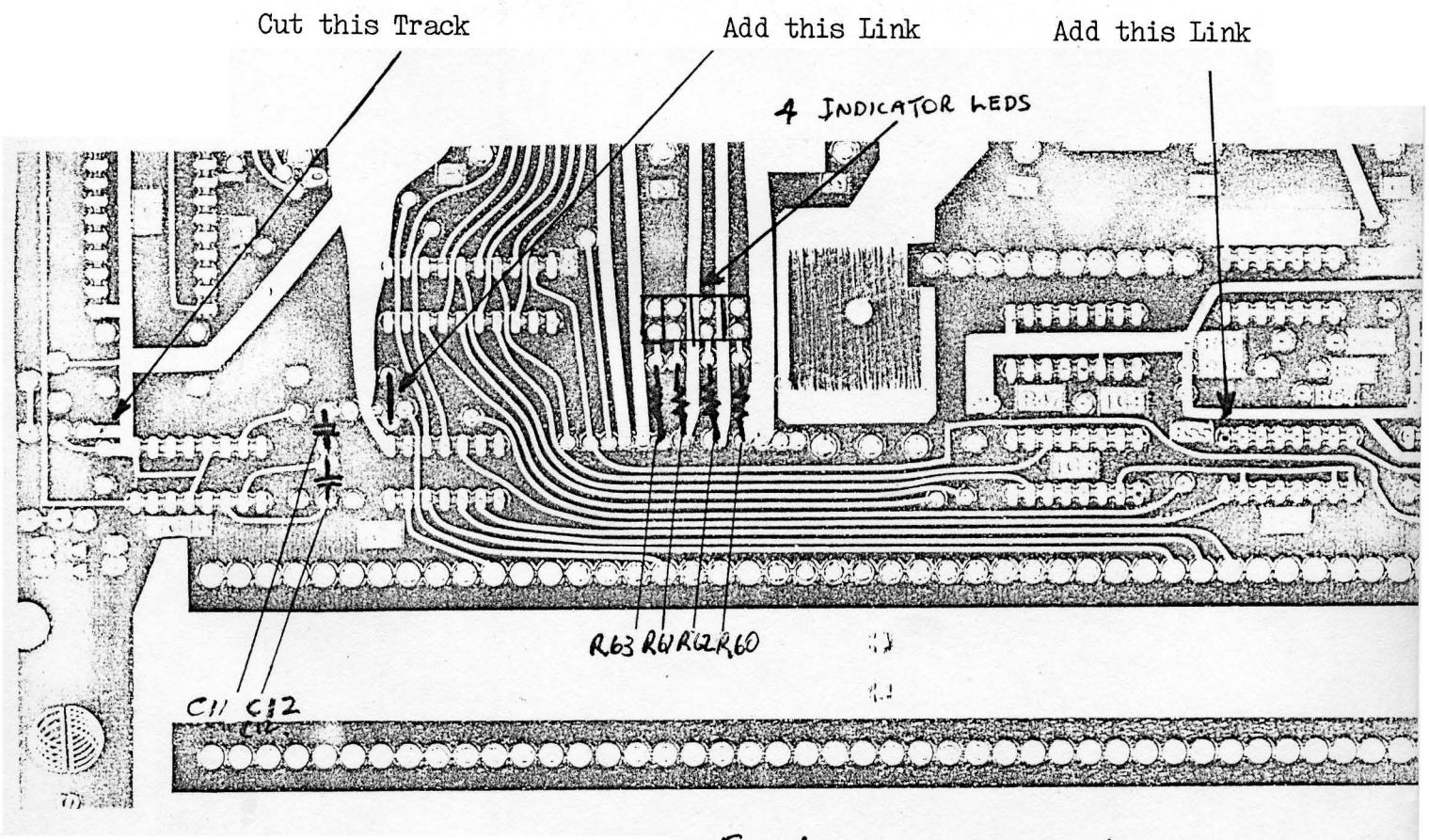

Fig. 1